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ABSTRACT

A multi-dimensional needs assessment model has been developed to provide a research tool for the review of statewide curriculum needs in vocational education. The model provides for an integrated review of selected demographic, educational, and decision-making data to target vocational education program areas and occupational titles for additional research and development while also reflecting the social, economic, and technological elements of society that impact on vocational education. It consists of five sequential parts with data categorized according to their distinctive sources. Six weighted community-based variables and 15 unweighted school-based variables are included in the model. Community-based data are collected through a two-stage DELPHI survey from selected state and federal data bases. School-based data are collected through site visits to vocational schools by research teams using a specifically designed curriculum rating schedule. The five parts of the model are (1) decision-making factors, (2) a DELPHI review (determination of those occupational titles in a vocational education program area likely to be most important during a projected 5-year period), (3) demographic importance (collection and application of state and federal data), (4) educational need (review of selected curriculum materials), and (5) a decision-assisting review. (YLB)

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CURRICULUM NEEDS ASSESSMENT: A MODEL FOR TRADE & INDUSTRIAL EDUCATION DECISION-MAKING

Presented by

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Rutgers University

December 6, 1981
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Introduction

The model described in this paper was developed through funds provided by the New Jersey State Department of Education, Division of Vocational Education and Career Preparation as part of a sustained research and development effort conducted at the New Jersey Vocational-Technical Curriculum Laboratory, Rutgers University.

The model was formatively developed during the first stage of the Statewide Curriculum Development Project. Specific project goals included the identification of vocational education program areas and occupational titles likely to be most important during a projected five year time period; the formulation of a consolidated and cost-effective approach to the development of curriculum materials for targeted vocational program titles in areas reviewed; and the design and implementation of a summative evaluation system for products developed.

Overall project goals of the Statewide Curriculum Development Project will be achieved through a sequence of five developmental stages. These include: Stage One, Needs Assessment; Stage Two, Curriculum Development; Stage Three, Field Testing and Formative Evaluation; Stage Four, Dissemination and Utilization; and Stage Five, Summative Evaluation.

Curricular Influences

Economic, technological and social changes have had a significant influence on the delivery of vocational education and the subsequent demands on curricular needs in recent years. Further, these change elements have had an affect on all considerations associated with the decision-making process used in the allocation of resources to meet educational objectives.

Domestic inflation has exhibited an ever increasing spiral growth pattern on the economy since the beginning of the United States involvement in Viet Nam.

Demands for reductions in the use of public funds for education and dramatic increases in the cost of energy further compounds this already critical economic situation.

Contemporary technological growth has been a major influence on the content of vocational education curriculum during the past few decades. Further, an accelerated technological growth pattern in the future is certain. The frequency of the number of innovations, the rate at which these innovations occur, the reduced period of time required for the infusion of these innovations into society as well as the influence which one innovation might have on the creation of a new innovation all contribute to the demands of preparing skilled entry level workers.

The civil liberties of all individuals in every aspect of American life have received profound attention during the last twenty years. A host of Federal Statutes and regulatory measures have been instituted to insure the educational rights of all persons seeking occupational entry regardless of their racial, sexual, cultural, physical, economic, emotional or intellectual background.

As an integral element of society, vocational education is directly influenced by the forces of economic, technological and social change. Through its dynamic role in society, vocational education has the distinction of also providing direct influence to these very same forces. Thus, a symbiotic relationship is identified which requires a continuous and interrelated growth mode if optimum benefit is to be expected. The collection and processing of data required for decision-making in vocational education is therefore complex as an activity and far reaching in its implications.

Description of the Model

Due to the complexity of our contemporary society, the development of a multi-dimensional needs assessment model was undertaken in order to provide a

research tool for the review of statewide curriculum needs in vocational education. Considerations incorporated in this model contributed to the utilization of an array of selected demographic, educational and decision-making data. The model provides for an integrated review of these data in order to target vocational education program areas and occupational titles for additional research and development as outlined in the remaining stages of the project. Furthur, this multi-dimensional needs assessment model reflects the social, economic and technological elements of society which impact on the vocational education community.

Specific outcomes of this model include: (1) vocational education program areas and specific titles with the greatest statewide need, (2) a weighted set of decision-making factors used in the allocation of vocational education resources, (3) a listing of demographic data for selected vocational education program areas and specific titles, (4) a descriptive profile of curriculum materials in selected vocational education program areas and specific titles currently in use throughout the state, and (5) a listing of the primary textbooks which are being used in selected vocational education program areas and specific titles throughout the state.

The needs assessment model may also be applied to municipal, county and regional settings for curricular decision-making. Data and findings of this model also aid the decision-making process for long range policy planning, facility development and space utilization.

Application of the Model

The New Jersey Statewide Curriculum Needs Assessment Model consists of five sequential parts with data categorized according to their distinctive sources. Six weighted community-based variables and fifteen unweighted school-based variables are included in this model. During application, community-

based data are collected from selected State and Federal data bases. School-based data are collected through site visitations to vocational schools by research teams using a curriculum rating schedule designed specifically for this activity. All data are mathematically interfaced to provide a rank-ordered listing of program titles based on calculated statewide need. A State level executive decision-assisting review of empirical findings and recommendations is the final element of this model. A detailed explanation of the procedures followed during each of the model's five parts will be presented during the remainder of this section.

Part I: Decision-Making Factors

Following discussion by members of a project advisory committee, a survey instrument including seven factors associated with the allocation of vocational education resources was developed. The mean weighted assignments given to these factors by a population of County Career Education Coordinating Council members in New Jersey (N=122) is included in Table 1.

Table 1
Weight Assignments Given to Decision-Making Factors

Decision-Making Factors	Mean (Weights)	S.D.
Job Market Demand (JMD)	28.85	12.99
Enrollment (ENROLL)	20.81	16.38
Placement Figures (PLACE)	17.59	11.09
Typical Job Earnings (WAGE)	10.71	9.25
No. of Disadvantaged Enrolled (DIS)	8.65	8.25
No. of Handicapped Enrolled (HAND)	8.63	8.08
No. of Limited English-Proficient Enrolled (LIM-ENG)	4.82	4.80

It should be noted that other decision-making factors could be used for weight assignments in future replication of the model. It is expected that factors affecting the allocation of resources for vocational education will change due to shifts in legislation, funding and social policy.

Part II: A DELPHI Review

An optional two-stage DELPHI survey element is included to determine which specific occupational titles in a vocational education program area are likely to be most important during a five year projected time block. The first DELPHI section includes an open response format. The second instrument utilizes titles which received the greatest frequency of responses from the first instrument, i.e. 1 S.D. above the mean. Respondents to the second DELPHI instrument rate titles listed according to their likely importance during the same projected time period using a five point Likert scale. The occupational titles with the highest ratings, i.e. 1 S.D. above the mean, from the second DELPHI survey are utilized later in the collection and application of data in the remaining parts of the model. It should be noted that depending upon the volume of titles to be considered, this part of the model may be considered as optional.

Part III: Demographic Importance

This part of the model involves the collection and subsequent application of selected data from State and Federal sources to calculate demographic importance scores for the vocational education program specific titles identified. The six weighted decision-making factors are mathematically applied to this data.

In outline form, the first three parts of the model are applied in the following manner:

1. Identify decision-making factors and determine their weighted values.*

$$(W_1, W_2, W_3, W_4, W_5, W_6, W_7)^*$$

2. Collect raw community and school based demographic data for each program specific title.

3. Normalize the demographic data within each vocational education program area by dividing the largest number into the remaining numbers in each decision-making factor category. The resulting normalized data will have a range from 1.00 to 0.00.

$$(A_1, A_2, A_3, A_4, A_5, A_6, A_7)$$

4. Calculate the Demographic Importance Scores (DIS) for each program specific title by multiplying the normalized data by the weighted value and summing across.

$$DIS = (W_1 A_1) + (W_2 A_2) + (W_3 A_3) + (W_4 A_4) + (W_5 A_5) + (W_6 A_6) + (W_7 A_7)$$

*Decision-making factor weights which were utilized during the formative development of this model:

W_1 = 28.85 (Job Market Demand)

W_2 = 20.81 (Enrollment)

W_3 = 17.59 (Placement Figures)

W_4 = 10.71 (Typical Job Earnings)

W_5 = 8.65 (No. of Disadvantaged Enrolled)

W_6 = 8.63 (No. of Handicapped Enrolled)

W_7 = 4.82 (No. of English-Proficient Enrolled)

Part IV: Educational Need

The fourth part serves to review selected curriculum materials in use throughout the state using a set of fifteen standards reflecting the generic elements of competency-based vocational education as well as considerations appropriate to special student populations through the use of a curriculum rating schedule developed specifically for this activity. A copy of this rating schedule is in-

cluded on the following page. Curriculum materials consisting of courses of study, lesson plans, course texts and instructional supplements are reviewed by research team members during on-site visitations. Data collected are converted to discrepancy scores by subtracting actual ratings from maximum rating values (4.0) and then averaging these in order to calculate educational need scores.

The demographic importance scores developed in the third part of the procedure are subsequently interfaced with the educational need scores from the fourth part of the procedure in order to facilitate the development of a rank ordered listing of vocational education program titles with the highest calculated statewide need.

In outline form, the educational need scores are calculated for the specific occupational titles identified in the demographic importance part of the model using the following procedure:

1. Collect raw data in each of the fifteen curriculum characteristic areas included on the research instrument.
2. Determine the mean rating of each curriculum characteristic area for program specific titles reviewed.
3. Calculate the educational need score by subtracting the combined mean rating of each curriculum characteristic within a program area from the perfect value rating used in the instrument (4.0).

A computational illustration of all data collected during the first four parts of the model as it is mathematically interfaced is provided in Table 2.

Part V: A Decision-Assisting Review

A rank ordered listing of findings based on calculated statewide need in a particular program area serves as a vehicle to initiate the final part of the model, an executive level decision-assisting review.

CURRICULUM RATING SCHEDULE
New Jersey Statewide Curriculum Development Project

Program Title_____ VEDS No._____Level of Delivery S___PS___

NUMERICAL VALUE

1	2	3	4
0 - 20%	21 - 50%	51 - 80%	81 - 100%

PERCENTAGE OF CHARACTERISTIC

___1. The materials contain objectives which include conditions, performances and criteria.

___2. The materials contain a system for evaluating students' performances, including tests and/or performance checklist that directly measure mastery of the objectives.

___3. The content covered in the materials is current and includes all the necessary knowledge, skills and attitudes.

___4. The materials are free of sex bias.

___5. The materials are accompanied by adequate instructor management information such as record-keeping forms, course sequencing, and directions for implementation.

___6. The materials are structured well enough and provide enough student directions to facilitate open-entry/open-exit, self-pacing and individualization.

___7. The materials are organized to permit a progression of employable skill development throughout the entire program.

___8. The materials are designed to facilitate integral record-keeping in relation to the Individualized Educational Program (IEP).

___9. The materials contain a system for continuous formative evaluation that facilitates communication with the I.E.P. Team.

___10. The materials contain prerequisite levels of cognitive, psychomotor, affective and perceptual skills necessary for successful entry into each instructional unit.

___11. The materials provide for prescriptive teaching techniques, alternative instructional materials, and individualized student learning activities that lend themselves to disparate learning styles.

___12. The materials have been field-tested with normal populations.

___13. The materials have been field-tested with handicapped populations.

___14. The materials have been field-tested with disadvantaged populations.

___15. The materials have been field-tested with gifted populations.

Primary Text:_____
(Author) (Title) (Copyright)

Origin of Curriculum Materials:_____
(date of origin - revision)

COMMENTS:

TABLE 2

COMPUTATIONAL DATA BASE FOR VOCATIONAL INDUSTRIAL EDUCATION:
SECONDARY LEVEL

PROGRAM SPECIFIC TITLE	OE/VEDS Code No.	RAW DATA JMD	ENROLL	PLACE	WAGE	DIS	HAND	LIM-ENG
Auto Mech	17.0302	1,337	2,948	--	222.00	78	771	139
Diesel Mech	17.1200	608	475	--	222.50	10	105	3
Electronics	17.1500	475	730	--	294.25	9	198	39
Solar Cluster ($\bar{X}$)	--	396	324	--	383.73	5	77	9
1. Plumb & Pipe	17.1007	670	323	--	455.19	6	71	10
2. Electrical	17.1400	218	586	--	340.60	6	152	16
3. Stationary Eng.	17.3200	302	65	--	356.00	3	9	1
Sci Data Proc	16.0117	405	25	--	357.30	0	1	0

		NORMALIZED DATA W(28.85)	W(20.81)	--	W(10.71)	W(8.65)	W(8.63)	W(4.82)	Demographic Importance Score	Educ. Need Score	Total	Rank
Auto Mech	17.0302	1.00	1.00	--	.57	1.00	1.00	1.00	77.86	1.74	135.48	1
Diesel Mech	17.1200	.45	.16	--	.57	.13	.14	.02	24.83	2.22	55.12	2
Electronics	17.1500	.35	.25	--	.77	.12	.26	.28	28.17	1.74	49.02	4
Solar Cluster ($\bar{X}$)	--	.30	.11	--	1.00	.06	.10	.06	23.33	2.21	51.56	3
1. Plumb & Pipe	17.1007	--	--	--	--	--	--	--	--			
2. Electrical	17.1400	--	--	--	--	--	--	--	--			
3. Stationary Eng.	17.3200	--	--	--	--	--	--	--	--			
Sci Data Proc	16.0017	.30	.01	--	.93	0	.001	0	18.84	2.18	41.07	5

A distinction should be noted between the decision-assisting approach chosen for the final stage of the model and the more common decision-making activity associated with data application. Data and findings of a research activity can be applied directly to decision-making per se or they can be reviewed and synthesized with other information and considerations as an aid to decision-making. The decision-assisting approach was chosen over the decision-making approach for utilization in the model for two primary reasons. First, it provides the flexibility necessary to introduce important considerations which were not possible to include in a quantifiable manner. Secondly, it provides an opportunity to introduce timely information that was unavailable or unknown earlier. Further, the decision-assisting approach has been compared to a fail-safe concept which can be used to insure the achievement of previously identified goals.

Summary and Conclusion

Six weighted community-based variables and fifteen unweighted school-based variables are included in this multi-dimensional model. Community-based data are collected through a two stage DELPHI survey and from selected State and Federal data bases. School-based data are collected through site visitations to vocational schools by research teams using a curriculum rating schedule designed specifically for this activity. All data are mathematically interfaced to provide a rank-ordered listing of program titles based on calculated statewide need. A State level executive decision-assisting review of empirical findings and recommendations is the final element of this model.

The statewide curriculum needs assessment model developed is significant in that it provides a systemic approach to the consideration of a host of variables affecting curricular decisions in vocational education. A distin-

guishing feature of this model is its ability to react to all program areas of vocational education in an equal fashion. Further, the overall findings of this model can also be applied to long range policy planning, facility development and space utilization. Specific components of the model such as the curriculum rating schedule, curriculum profile charts and such provide for additional independent application by persons involved in curriculum review, validation and/or development.